12 CHANNEL AUDIO CONSOLE

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Universiti Malaysia Sarawak
2000

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Tesis Dikemukakan Kepada

Fakulti Kejuruteraan, Universiti Malaysia Sarawak

Sebagai Memenuhi Sebahagian daripada Syarat

Penganugerahan Sarjana Muda Kejuruteraan

Dengan Kepujian (Kejuruteraan Elektronik dan Telekomunikasi)

1999/2000

Borang Penyerahan Tesis
Universiti Malaysia Sarawak

R13a

BORANG PENYERAHAN TESIS

Judul: 12 Channel Audio Console

SESI PENGAJIAN: 1999/200

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(HURUF BESAR)

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Dedicated to my beloved family

ACKNOWLEGMENTS

First of all, special thanks to the Dean of Faculty of Electronics and Telecommunications Engineering, Prof Madya Dr. Mohamad Kadim Suadi and to my supervisor, Mr. Al-Khalid for giving me support, ideas and motivation in accomplishing the objectives of this thesis project.

Appreciation is owned to the lecturers, the tutors, colleagues and especially to Encik Wan Abu Bakar who had given motivations, cooperation and helped me to finish this thesis at the Faculty of Electronics and Telecommunications Engineering of UNIMAS. Last but not least, to my beloved parents and my family for giving encouragement to me throughout the years.

ABSTRAK

Pada zaman sekarang, sistem audio memainkan peranan yang penting dalam menghasilkan bunyi yang lebih bermutu dan berkualiti bagi memberi kepuasan kepada para pendengar. Terdapat pelbagai jenis sistem audio tetapi tesis ini lebih banyak menitikberat terhadap sistem *audio console*. Sistem *audio console* amat jarang didengar tetapi peranannya amat penting dan banyak digunakan dalam bidang penyiaran. Tesis ini akan membincangkan dalam merekabentuk sebuah sistem audio *console*, komponen yang digunakan serta masalah yang dihadapi. Beberapa cadangan serta kesimpulan juga disertakan diakhir laporan tesis ini.

ABSTRACK

Nowadays, audio system plays an important role in producing good and better quality sounds that satisfy the listeners. There are several types of audio system but this thesis is more concern about the audio console system. We seldom hear about audio console system but its role is very important and is widely used especially in broadcasting area. This thesis discussed the architecture and design of the audio console as well as the components that being used and the problem faced. Some conclusion and recommendation are included at the end of this thesis report.

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LIST OF FIGURE

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CHAPTER 1

1.0 INTRODUCTION

Audio console is a toll for achieving a good and better quality of sound. It is commonly been used for broadcasting and for recording such as Radio Televisyen Malaysia (RTM), Cats Radio, BMG and others production house for recording. Audio console can adjust the volume, the tone and the master control for audio signal. This adjustment is needed due to the difference types of music such as rock, pop, soul and others. By using the adjustment for control, distortion can be avoided or can be minimized.

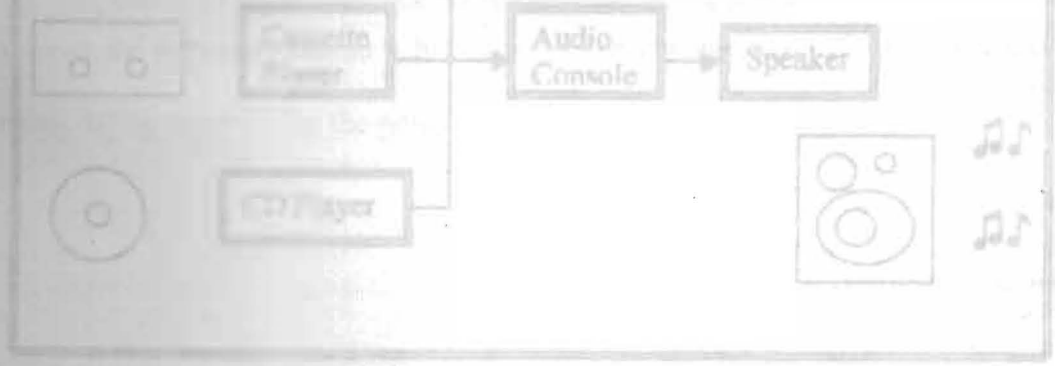
1.1 Project Overview

The designing of an audio console is to distribute the input of audio signal such as microphone, compact disc players or cassette players to a common sound distribution system such as equalizer, power amplifier or speakers and the output signal can be modified in terms of volume or tone. Before distributing the audio signal to a common sound distribution system, the audio signal is mixed together in the audio console to get a better quality of sound and give satisfaction to the listener.

Audio console actually has some important similarities to a simple home stereo receiver. A stereo receiver can controls to set overall volume, the balance between left and right speakers and some tone controls to shape the overall sound. The audio console does many of the same things including changing levels and tone.

The most important difference between an audio console and a stereo system is that an audio console can control and combine or mix sounds from many different sources at once. Rather than simply choose between one sound and another, an audio console gives the option to can adjust and combine all variable of sound at the same time and produce a better quality of sound. But this adjustment can not be achieved by using home stereo system.

The audio console can be described as a traffic manager for all the individual audio signals by providing signal routing. The signal routing is depending to the person who controls the audio console and the type of music.



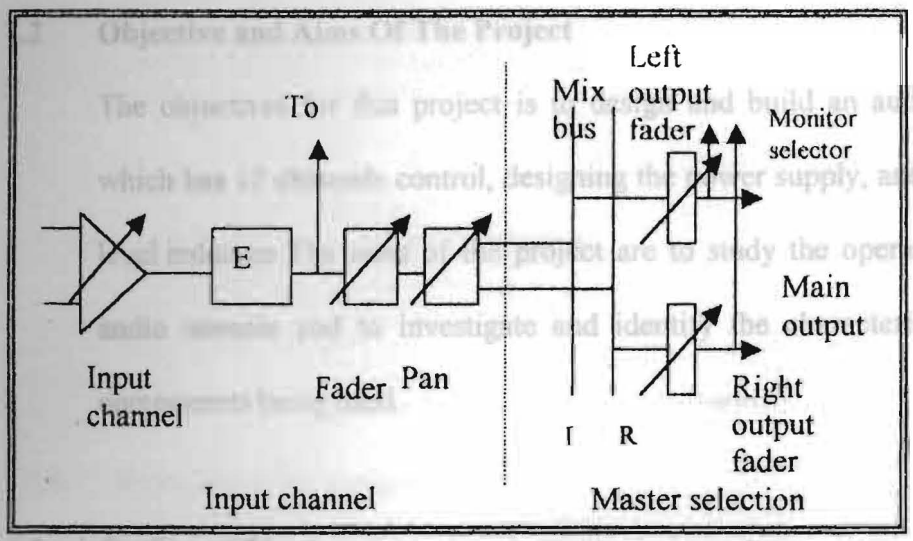


Figure 1.1.1: Block diagram from channel input to main output of audio console

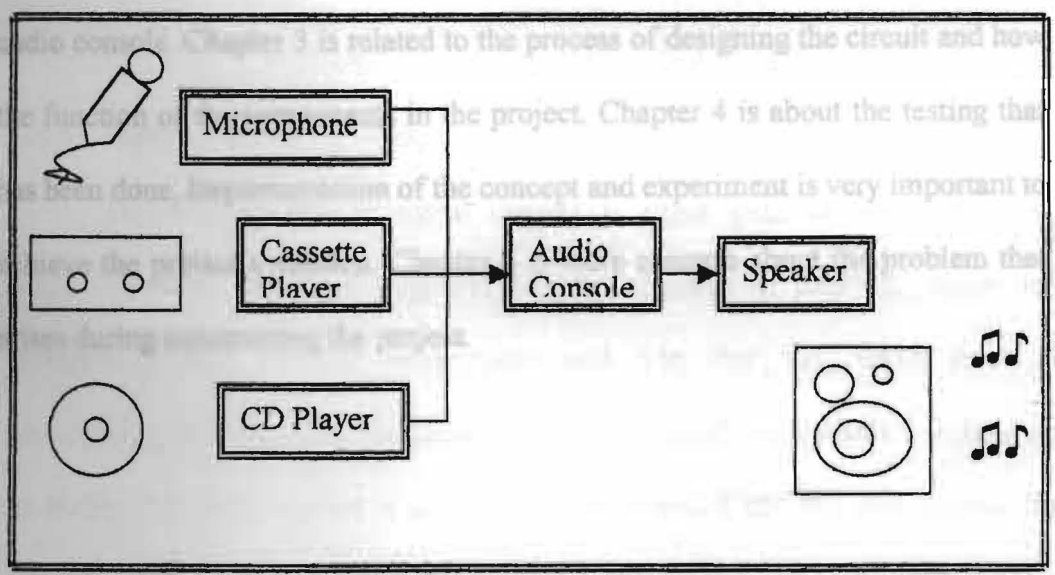


Figure 1.1.2: Diagram for function of audio console

1.2 Objective and Aims Of The Project

The objectives for this project is to design and build an audio console which has 12 channels control, designing the power supply, and the meter level indicator.The aims of the project are to study the operation of the audio console and to investigate and identify the characteristic of the components being used.

1.3 Outline of Thesis

This thesis includes five chapters. In the chapter 1 of this thesis report consists of the project overviews and the description of an audio console. Chapter 2 discusses more on the literature review about the basic idea of designing an audio console. Chapter 3 is related to the process of designing the circuit and how the function of the components in the project. Chapter 4 is about the testing that has been done. Implementation of the concept and experiment is very important to achieve the project's mission. Chapter 5 is more concern about the problem that arises during constructing the project.

CHAPTER 2

2.0 Description for audio console

Audio console consists of two parts such as input section and output section. The input section is a part where the audio signal is connected to the audio console. Output section is more to how the audio that being process is distributed

2.1.1 Input Channel

The first control in signal change is input gain or sensitivity. The amplification of the input amplifier can be adjusted in decibels. Inputs are normally located between microphone and line. For the output level of microphone, the input gain is adjusted to raise the signal to a suitable line level up to 80dB. The amplification is used at the line position and the gain control for adjustment is either 0dB for unity gain or ± 20dB. The tone control provide a boost and cut of around ± 12dB. Over broad low frequency and high-frequency bands. [2]

Input gain control is to sets the microphone or line input to match the level of incoming signal.

line input. Line input is can be playback of cassette, CD player or others equipment.[2]

2.1.2 Output Section

The two main output faders (left and right) control the overall level of the channel signals, which have been summed on the left and right mix buses. The outputs of the faders feed the main output connectors on the rear panel and an internal feed is taken from the main outputs to the monitor selector. [2]

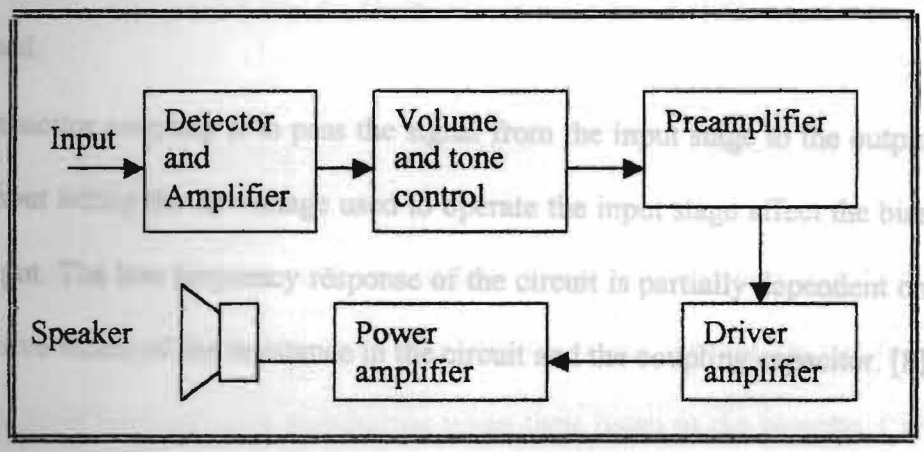


Figure 2.1.2: Block diagram for audio system

2.2 AUDIO AMPLIFIER

In the world of audio system, the amplifier has much application. Basically, amplifier is a device that can increase the power of signal. It receives a weak audio signal from the input source and provides a larger signal at the output.

Sometimes, output signal can be increased twice than the input signal. The output waveform must have the same shape as the input waveform but different in amplitude of the waveform.

2.2.1 Amplifier Coupling

It is important to provide some method of coupling between amplifier stages that are connected cascade. When passing a signal from one stage to the next cascade chain, the proper condition can be met. The coupling circuit must not just couple the signal; it must match the impedance between the stages so that the maximum power transfer occurs when the impedance of the source and load are matched.

Capacitor coupling is to pass the signal from the input stage to the output stage without letting the dc voltage used to operate the input stage affect the bias of the output. The low frequency response of the circuit is partially dependent on the respective values of the resistance in the circuit and the coupling capacitor. [8]

2.2.2 PREAMPLIFIER

Preamplifiers provide the interface between low-level signals from microphones, phono pickups, and so on and the various signal-processing equipment in a sound system or a studio. [3]

Normally, the preamplifier is located near to the transmitting source and before the amplifier. This is because the preamplifier can select the low input

audio signal from sources and amplified the audio signal. This process is necessary so that the audio signals are in the size and can be formed to drive to the power amplifier. The main purpose for using a preamplifier is to increase the signal voltage.

2.3 Controls

With any audio system, it is necessary to provide an adjustment for the overall signal level. This adjustment is known as gain control or volume control. The adjustment can let the listener to select the volume or tone depends on their interest in music. This control will be placed inside the preamplifier.

2.4 Tone Control

Nowadays, listeners are preferred to hear music with the best quality of sound by controlling the tone control. This can make the listener do not feel boring or getting tired and give satisfaction when their listen to the cassette, CD or radio.

The tone control can modify the frequency response of the system and determined the degree of the roll off curve. It also can provide a stable gain for small signal, which have low input noise, provide little or no sensitivity to induce and no distortion. Tone can modify the tonal characteristic of the signal chain. Tone control can be formed into treble and bass. Treble is used to adjust the high-frequency response of an audio amplifier. Meanwhile, bass is used to adjust the

low-frequency response. This adjustment is important due to the variation of human ear. [2]

In audio systems, it has a tone control that feature boosting or cutting the volume of bass or treble frequencies. The practical tone-control circuit shown in Figure 2.2 features boost or cut of bass frequencies below 500Hz and of treble frequencies above 2kHz and eliminates attenuation. Refer to [8] for more information. Basic tone control can be seen in Figure 2.4.1. and Figure 2.4.2.

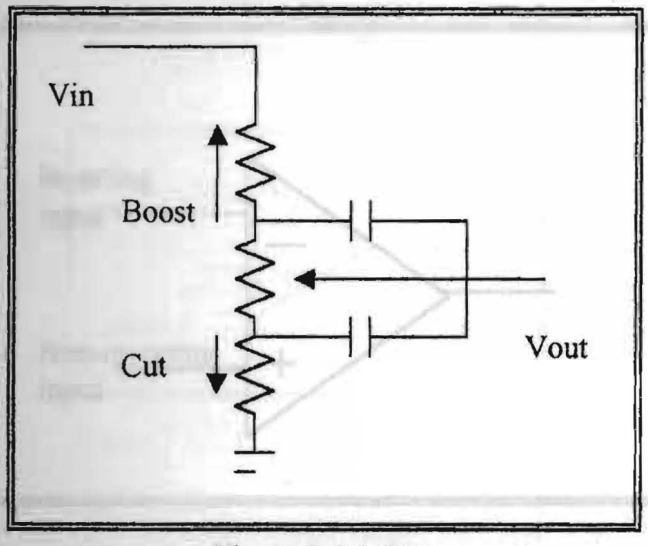


Figure 2.4.1: Bass

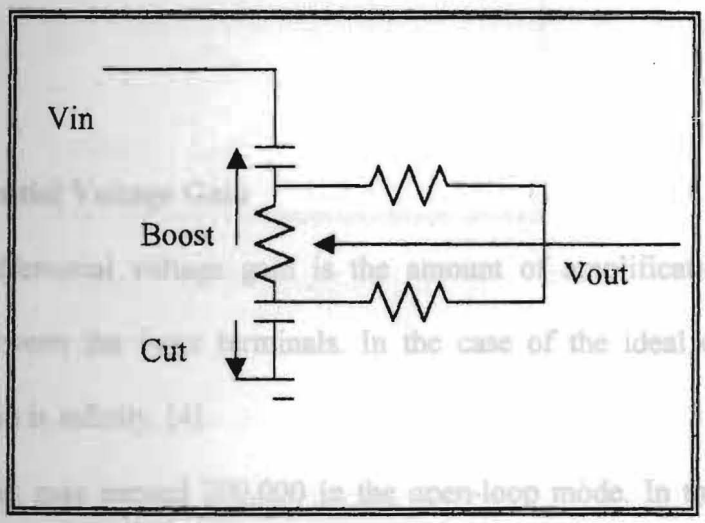


Figure 2.4.2: Treble tone control

2.5 OPERATIONAL AMPLIFIER

Operational amplifier is used to allow as a wide variety of audio and video applications. The basic schematic symbol for an op amp is shown in figure 4.0. It has the inverting and noninverting inputs labeled (-) and (+), respectively and has a single output. [4]

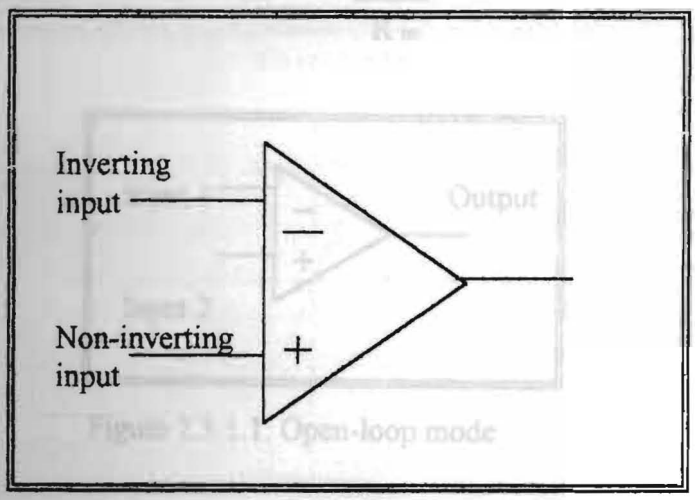


Figure 2.5: Operational Amplifier

2.5.1 Differential Voltage Gain

The differential voltage gain is the amount of amplification given to voltage appearing between the input terminals. In the case of the ideal op amp, the differential voltage gain is infinity. [4]

The gain may exceed 200,000 in the open-loop mode. In the open-loop mode there is no feedback from the output o the inputs as the voltage gain is